

# Glass: The Problem Child of Single Stream MRF's

Ted Siegler

DSM Environmental Services, Inc.

# Perspective

- Glass represents roughly 15 to 20 percent by weight of inputs to the MRF
- Is typically the only commodity with a negative value
  - Depending on the MRF and the market
- Typically removed at the beginning of the process to reduce conveyor wear and cross contamination of other materials
- Needs to be greater than  $3/8$  to  $5/8^{\text{th}}$  inches in size to further process it
- At that size it typically contains a significant amount of the less than 2-inch material entering the MRF
  - Bottle caps
  - Chicken bones
  - Shredded paper

# Camden County MRF Audit, May 2021

COMMODITY	LBS	TONS	FACILITY		Est.	
			MIX	PRICING	ACR \$\$	
Mixed Paper	82,154	41.1	26.33%	\$ 50.00	\$ 13.17	
OCC	82,451	41.2	26.43%	\$ 120.00	\$ 31.71	
SOW	0	0.0	0.00%	\$ -	\$ -	
PET	17,317	8.7	5.55%	\$ 340.00	\$ 18.87	
HDPE NAT	3,281	1.6	1.05%	\$ 1,800.00	\$ 18.93	
HDPE Colored	4,196	2.1	1.34%	\$ 820.00	\$ 11.03	
Mixed Plastics-PP#5	1,342	0.7	0.43%	\$ 60.00	\$ 0.26	
Tin	6,429	3.2	2.06%	\$ 230.00	\$ 4.74	
Aluminum	5,166	2.6	1.66%	\$ 1,220.00	\$ 20.20	
Aseptic	0	0.0	0.00%	\$ -	\$ -	
Rigid Plastic	2,740	1.4	0.88%	\$ 60.00	\$ 0.53	
Residue	45,887	22.9	14.71%	\$ (72.50)	\$ (10.66)	
Glass	58,940	29.5	18.89%	\$ (24.50)	\$ (4.63)	
Scrap Metal	2,072	1.0	0.66%	\$ 120.00	\$ 0.80	
	311,975	155.99	100%		\$ 104.95	

# Glass Processing

- Glass from single stream MRFs requires an intermediate step, both to make it marketable to a glass processing facility, and at the glass processing/beneficiation facility to produce bottle grade cullet and/or an input to fiberglass manufacturer.
- Strategic is one of the largest secondary glass processors
  - Others include Rumpke (OH), Monument Glass (CO)
- Glass processing includes sorting out contaminants, color sorting for bottle glass (typically 3/8 and greater), and pulverizing (3/8 inch minus) for fiberglass inputs

# Economic Problem

- There are energy savings associated with substituting cullet for virgin materials, but they are not as great as the energy savings associated with other materials
  - Roughly 13 percent energy savings associated with cullet when compared to 90 percent for aluminum and 75 percent for recycled PET
- And bottle glass manufacturing requires a very specific input of clean cullet – with significant limitations for clear bottles, but also limitations on amber for colored bottles
  - And ceramics are not tolerated
- Limitations for fiberglass inputs are less, but it must be pulverized to a size that any ceramics or other non-meltable materials will pass through the fine nozzles of the spinnerets
- The crux of the problem is that glass manufacturers cannot pay much of a premium for cullet, meaning that the glass beneficiation plants cannot pay much for the material coming out of the MRF's, and transport costs of MRF glass to processing plants are high.
- That is why Bottle Bill Glass is so valuable to glass beneficiation plants
  - It is typically much less contaminated, and often sorted by color

# But Not All Glass Is Subject to Bottle Bills in Deposit States

Massachusetts, circa 2016 – DSM for MA Beverage Ass.

	Sold (tons)	Recycled/Recovery (2) (tons)	Net Recovery (3) (tons)
Deposit Redemption	134,500	89,600 (4)	87,800
Other Recycling Systems	154,900	99,300	69,500
<b>Totals:</b>	<b>289,400</b>	<b>188,900</b> -65%	<b>157,300</b> -54%

- Massachusetts has a traditional bottle bill for carbonated beverages only
- Excludes liquor and wine (large source of bottle glass), and food packaging
- Therefore, MRF's receive a lot of glass
- More glass is collected for recycling through the MRFs than through the bottle bill
- But loss rates for contamination are much higher for MRF glass – therefore more glass is actually recycled through the bottle bill

# An Expanded Bottle Bill Would Help, But Still A Lot Available to the MRF

VT Waste Composition, circa 2017

Material Subsorts	Absolute Pct	Relative Pct	Tons
<b>#1 PET Bottles</b>	<b>0.9%</b>	<b>100.0%</b>	<b>1,832</b>
#1 PET Bottles BB	0.2%	18.5%	340
#1 PET Bottles EBB	0.4%	42.4%	777
#1 PET Bottles None	0.1%	8.7%	160
#1 PET Food and Dairy Bottles and Jars	0.3%	30.3%	556
<b>#2 HDPE Bottles</b>	<b>0.6%</b>	<b>100.0%</b>	<b>1,167</b>
#2 HDPE Bottles BB	0.0%	0.0%	-
#2 HDPE Bottles EBB	0.1%	10.9%	127
#2 HDPE Bottles None	0.1%	21.7%	253
#2 HDPE Food and Dairy	0.4%	67.4%	787
<b>#3-#7 Bottles</b>	<b>0.1%</b>	<b>100.0%</b>	<b>238</b>
#3 - #7 Bottles BB	0.0%	3.6%	9
#3 - #7 Bottles EBB	0.0%	5.1%	12
#3 - #7 Bottles None	0.1%	91.2%	217
<b>Glass Beverage Bottles</b>	<b>1.5%</b>	<b>100.0%</b>	<b>3,031</b>
Glass Beverage Bottles BB	0.3%	21.3%	645
Glass Beverage Bottles EBB	0.6%	35.6%	1,080
Glass Beverage Bottles None	0.1%	5.9%	179
Food and Dairy Glass	0.6%	37.2%	1,128
<b>Aluminum Beverage Cans</b>	<b>0.7%</b>	<b>100.0%</b>	<b>1,370</b>
Aluminum Beverage Cans BB	0.2%	24.0%	329
Aluminum Beverage Cans EBB	0.1%	8.9%	123
Aluminum Beverage Cans None	0.0%	0.8%	11
Aluminum Foil, Pans & Food Cans	0.5%	66.2%	907

- This table illustrates the economic problem with an expanded bottle bill
- While it removes a significant amount of glass, it also removes a significant amount of valuable PET and Aluminum from the MRFs

# The Problem With Bottle Bills

- They are a costly system over-laid on a comprehensive municipal collection system for other residential recyclables
- There are significant costs to consumers
- And there are significant revenue losses to the municipal system and MRF's

# Impact on Consumers

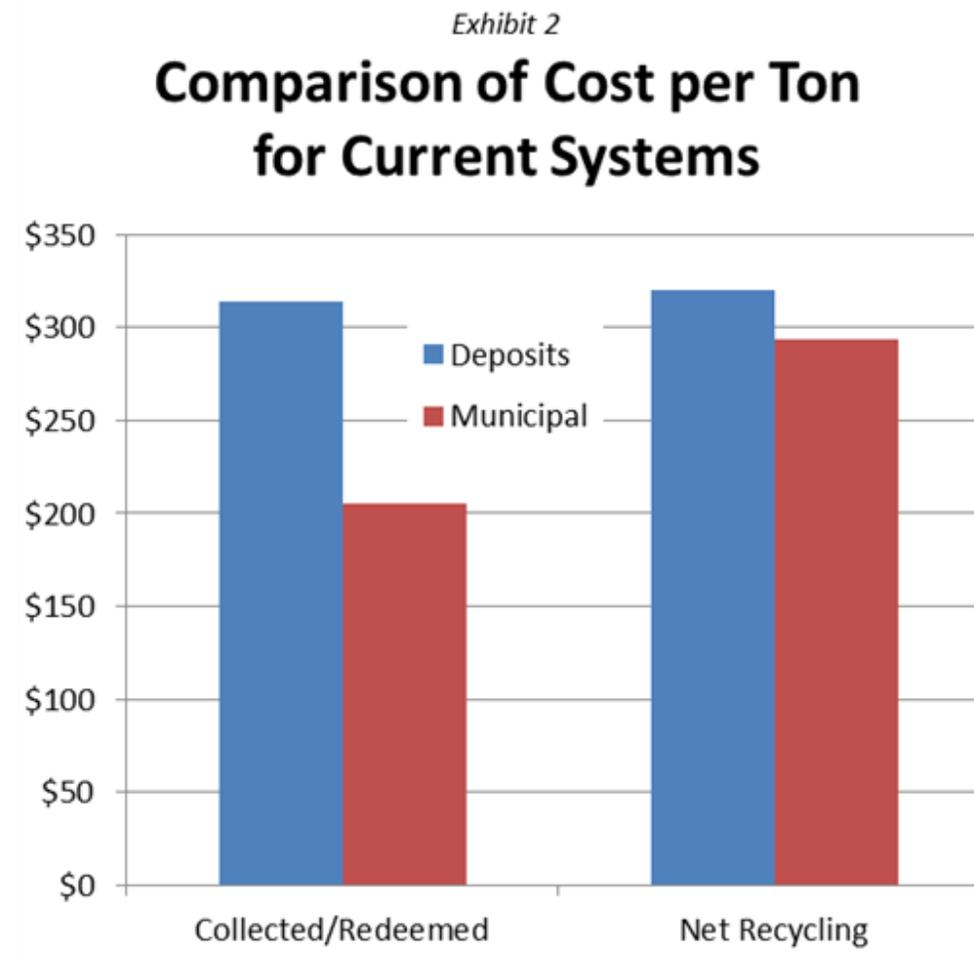
- If 77 percent of beverage containers are recovered under a deposit scheme consumers lose roughly 23% of the deposits they pay (“Escheats” which are captured by the State)
- Just as importantly consumers pay 3.5 to 4 cents per container in handling fees that are never recovered by the consumer
- Consumers also have to return the containers to specific locations in VT
  - DSM’s surveys of consumers redeeming containers in VT in 2006 concluded that consumers made 950,000 special trips for a combined mileage of 7.6 million miles per year, costing them \$3.67 million based on the IRS mileage rate
  - Equivalent to 3,000 metric tons Carbon Dioxide equivalent emissions per year
  - Requiring consumers to return beverage containers under a separate system from the current curbside and transfer station-based system has significant climate and cost impacts



# Costs

- DSM's estimate for the Act 148 analysis of an expanded bottle bill (completed in 2013 but still relevant today) concluded that an expanded bottle bill would increase bottle bill costs by roughly \$4 million per year
  - While capturing at most another 4,000 tons of material
- Costs include a reduction in recycling revenues by roughly 50 percent because of the loss of valuable aluminum and PET containers that are taken out of the curbside and drop-off programs and diverted to redemption centers
  - This is very important to municipalities which count on revenue sharing to control their recycling costs

# Comparison of Glass Recycling Costs, Massachusetts c.2016



# Systems Analysis, Massachusetts Alternatives

	<b>Current System</b>	<b>Alternative 1: Expanded Deposits; No Curbside Glass</b>	<b>Alternative 2: No Deposits; Modify Existing System</b>	<b>Alternative 3: No Deposits; Enhanced Collection and Processing</b>
<b>Stakeholder Costs</b>				
Net System Cost (\$ millions)	\$48.5	\$43.6	\$26.0	\$29.4
Distributors/Retailers	\$13.8	\$21.7	\$0.0	\$8.0
Consumers	\$14.3	\$17.2		
Municipalities/Ratepayers	\$20.4	\$4.7	\$23.5	\$18.9
Bars/Restaurants	(1)	(1)	\$2.5	\$2.5
<b>Incremental (Savings) or Cost vs. Baseline (\$ millions)</b>				
		(\$4.9)	(\$22.5)	(\$19.1)
Distributors/Retailers		\$7.9	(\$13.8)	(\$5.8)
Consumers		\$2.9	(\$14.3)	(\$14.3)
Municipalities/Ratepayers		(\$15.7)	\$3.1	(\$1.5)
Bars/Restaurants			\$3.5	\$3.5
<b>Net Recovery and Cost/Ton</b>				
Net Recovery of Glass (tons)	157,000	176,000	130,000	154,000
Recovery Rate	54%	61%	45%	53%
Cost/Ton	\$308	\$247	\$200	\$191

# Conclusions (MA Study)

- The current system of a deposit on some glass with the remainder going through MRFs is the costliest alternative
- Expanding the bottle bill to all glass beverage containers, eliminating glass in the curbside programs, while providing drop-offs for glass recycling is slightly less costly and results in the highest recovery of clean glass
- Eliminating the deposit and making significant investments in glass processing at the MRFs and intermediate glass processing is the least costly, but also has lower recovery rates than an expanded bottle bill for glass
  - Similar to the Rumpke system in OH
  - Would require investment in glass processing in New England
  - And assumes that there are markets for bottle and fiberglass cullet in New England region